

CLAIMS**What is claimed is:**

[c1] 1. A fiber optic coupler for coupling a tapered optical element, said coupler comprising:

- a metal tube having an inner circumferential surface, a first open circular end, a second open circular end, and a central axis; and
- a clear hollow insert, positioned within the inner circumferential surface of said metal tube, said hollow insert including;
- an input tapered region extending from said first open circular end for a first predetermined distance along said central axis, said tapered region including a first plurality of grabbers, each one of said first plurality of grabbers extending radially from said inner circumferential surface of said metal tube and said first plurality of grabbers collectively defining a first portion of a cone extending from said first open circular end,
- a coupling region, starting at said first predetermined distance from said first open circular end and extending a second predetermined distance along said central axis, the radial thickness of said coupling region defining a second portion of said cone extending from said first open circular end, and
- a constant area region extending to said second open circular end along said axis, said constant area region including a second plurality of grabbers wherein each one of said second plurality of grabbers extends radially from said inner circumferential surface for a third predetermined distance.

[c2] 2. The coupler of claim 1 in combination with a tapered optical element inserted into said first open circular end and an optical fiber inserted into said second open circular end wherein said metal tube is deformed in order to fix the tapered optical element and the fiber in alignment.

[c3] 3. The combination of claim 2 further comprising an index-matching medium in optical communication with opposing faces of said tapered optical element and said optical fiber.

[c4] 4. The combination of claim 3 wherein said index-matching medium is microencapsulated silicone.

[c5] 5. The coupler of claim 1 wherein said metal tube has an outer diameter of about 5.7 millimeters and an inner diameter of about 5.2 millimeters.

[c6] 6. The coupler of claim 1 wherein said clear hollow insert is composed of silicone.

[c7] 7. A method for coupling a tapered optic element to an optical fiber comprising the steps of:
positioning a clear hollow insert having a lower refractive index than said tapered optical element within the inner circumferential surface of a deformable tube having a first open circular end and a second open circular end, said clear hollow insert having;
an input tapered region including a first plurality of grabbers extending radially from the inner circumferential surface of said deformable tube,
a coupling region starting at a first predetermined distance from said first open circular end and extending a second predetermined distance along a central axis of said deformable tube, and

a constant area region including a second plurality of grabbers extending radially from the inner circumferential surface of said deformable tube;

inserting said tapered optical element into said first open circular end of said deformable tube and in contact with said first plurality of grabbers;

inserting said optical fiber into said second open circular end of said deformable tube and in contact with said second plurality of grabbers; and

crimping said deformable tube at said first and second plurality of grabbers to mechanically secure the tapered optical element and the optical fiber.

[c8] 8. The method of claim 7 further comprising the step of:

providing an index matching medium between a face of said tapered optical element and a corresponding face of said optical fiber.

[c9] 9. The method of claim 7 wherein the step of crimping said deformable tube further comprises the steps of:

a) crimping said deformable tube at a first crimp zone in the proximity of said first plurality of grabbers, thereby mechanically securing said tapered optical element ; and

b) crimping said deformable tube at a second crimp zone in the proximity of said second plurality of grabbers, thereby mechanically securing said optical fiber.

[c10] 10. The method of claim 6 wherein the deformable tube is a metal tube and the clear hollow insert is a molded silicone part and said step of positioning comprises:

inserting the molded part to be in contact with the inner circumferential surface of the metal tube.

[c11] 11. A fiber optic coupler for coupling a tapered optical input to an optical fiber output, said coupler comprising:

a deformable tube; and

a hollow silicone insert positioned within said tube and abutting the inner surface of said tube, said silicone insert including,

a tapered input region having a first set of grabbers extending radially inward and within which the tapered optical input will extend,

a constant radius output region having a second set of grabbers extending radially inward and within which the optical fiber output will extend, and

a coupling region between said tapered input and said constant radius output regions and within which opposing surfaces of the tapered optical input and the optical fiber output will be together.

[c12] 12. The fiber coupler of claim 11 wherein the taper of the tapered input region of the silicone insert matches the taper of the tapered optical input.

[c13] 13. The fiber coupler of claim 12 wherein the grabbers of said first set are progressively closer together towards said coupling region.

[c14] 14. The fiber coupler of claim 13 wherein the grabbers of said second set are equi-spaced from each other in said constant radius output region.

[c15] 15. The fiber coupler of claim 11 wherein said deformable tube is of metal and said hollow silicone insert is a molded part inserted into and abutting the inner surface of said metal tube.